UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/896,272	06/29/2001	Ajit V. Rao	207494	8010

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LEYDIG VOIT & MAYER, LTD
TWO PRUDENTIAL PLAZA, SUITE 4900
180 NORTH STETSON AVENUE
CHICAGO, IL 60601-6780

EXAMINER
NOLAN, DANIEL A

ART UNIT	PAPER NUMBER
2654	11

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>08 January 2002</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

　　4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-9 and 12-24* is/are allowed.

6)☒ Claim(s) *10 and 11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>08 January 2002</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

　　Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

　　Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

　　a)☐ All   b)☐ Some * c)☐ None of:

　　　1.☐ Certified copies of the priority documents have been received.

　　　2.☐ Certified copies of the priority documents have been received in Application No. _____.

　　　3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

　　* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
　　Paper No(s)/Mail Date *7,8,10*.

4)☒ Interview Summary (PTO-413)
　　Paper No(s)/Mail Date. *11*.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

Drawings

1.   The drawings were received on 03 January 2002. These drawings are accepted, replacing those that were published with the application.

Specification

2.   The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification, such as:

-     "Commonplace" should be one word (page 1 line 15).

-     "Step" should be singular (line 11 page 28, line 20 page 32).

3.   The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested:

"Continuous Time Warping for Low Bit-Rate CELP Coding".

Claim Rejections - 35 USC § 103

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

Kroon et al & Cuperman et al

5.   Claims 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over <u>Kroon</u>

<u>et al</u> (U.S. Patent 4,932,061A) in view of <u>Cuperman et al</u> ("A Novel Approach To

Excitation Coding In Low-Bit-Rate High-Quality CELP Coders", 2000 IEEE Workshop on

Speech Coding, September 2000).

6.   Regarding claim 10, <u>Kroon et al</u>, with the invention for a *multi-pulse excitation*

linear-predictive speech coder, reads on the claim for *an apparatus for modifying a*

speech signal prior to coding the speech signal as follows:

-       <u>Kroon et al</u> read on the feature of a *linear prediction coefficient extraction module for*

        receiving a digital speech signal and for producing a set of linear prediction

        coefficients (as *prediction parameters* in column 1 lines 9-12);

-       <u>Kroon et al</u> read on the feature of *an inverse synthesis filter for receiving the digital*

        speech signal and the linear prediction coefficients and for producing a residual

        signal (column 2 lines 13-17);

Kroon *et al* does not detail *time warping*. Cuperman *et al*, in publishing that the

efficiency of excitation coding with CELP at low bit rates is achieved by encoding the

fixed excitation localized in a set of windows, with positions adaptive to the pitch peaks,

read on the feature of *a residual modification module for time warping the residual*

signal (last 4 lines of right column page 14) *based on a continuous linear warp contour*

selected from the set of all possible warp contours by calculating only a subset of all

possible warp contours (figure 29(a) page 15), *whereby a modified residual signal*

having a regular rather than irregular array of dominant peaks is produced (figure 29(b)

page 15); *and a synthesis filter for receiving the modified residual signal and the linear*

prediction coefficients for producing a modified digital speech signal suitable for low bit

rate coding (with the *synthesis filter* in figure 1 page 15).

It would have been obvious to a person of ordinary skill in the art of speech

signal processing at the time of the invention to apply the method/teachings of

Cuperman *et al* to the device/method of Kroon *et al* so as to limit the samples to those

essential ones containing the bulk of the excitation energy.

7.   Regarding claim 11, the claim is set forth with the same limits as claim 10.

While Kroon *et al* teaches *linear prediction coding* producing speech signals (1 in figure

1), no mention is made of either CELP or stochastic code modules, whereas Cuperman

et al specifically applies the disclosure to CELP, reading on the feature of *a codebook*

excited linear prediction coder module for receiving the modified digital speech signal

and for producing a compressed speech signal (1st sentence, section 5, right column page 16).

It would have been obvious to a person of ordinary skill in the art of speech signal processing at the time of the invention to apply the method/teachings of Cuperman *et al* to the device/method of Kroon *et al* so as to improve the quality differences from the cumulative effects of quantization.

Allowable Subject Matter

8.   Claims 1-9 and 12-24 are allowed.

9.   The following is a statement of reasons for the indication of allowable subject matter:

-   The present invention is directed to *time-warping low bit-rate CELP signals.*

-   Claims 1 and 12 identify the uniquely distinct feature of *"preparing a frame of a digital speech signal for compression by producing a linear prediction residual for the frame* under a series of steps, as follows:

Freeman *et al*, with the invention for speech coding using sparse vector codebook & cyclic shift techniques, reads on the claim for *a method of preparing a frame of a digital speech signal for compression*, by reading on the feature of *producing a linear prediction residual for the frame* albeit without specifying the further limit of this feature, of *the linear prediction residual having irregularly spaced dominant peaks.*

Residuals produced <u>without motive to alter the result</u> will obviously have the

characteristic of *having irregularly spaced dominant peaks* (see <u>Su</u> figures 10a through

10c). Where <u>Freeman *et al*</u> does not disclose dividing the residuals, Cuperman <u>*et al*</u>

read on the step of *dividing the residual into a series of contiguous, non-overlapping*

sections, each section containing not more than one dominant peak (in figure 2(b) page

15). <u>Cuperman *et al*</u> also read on the step of *deriving an idealized signal having a*

series of regularly-spaced dominant peaks located in a series of sequential sections (in

figure 2(b) page 15) and <u>Cuperman *et al*</u> read on the step of *associating each section of*

the residual with a corresponding section of the idealized signal (left column 6th line

page 16) such that it would have been obvious to a person of ordinary skill in the art of

speech signal processing at the time of the invention to apply the method/teachings of

<u>Freeman *et al*</u> to the device/method of <u>Cuperman *et al*</u> so as to limit the samples to

those essential ones containing the bulk of the excitation energy.

Where neither <u>Freeman *et al*</u> nor <u>Cuperman *et al*</u> mention *pitch lag contouring*,

<u>Gao</u>, with the invention for a *speech coder using warping in long term preprocessing*,

reads on the step of *calculating a linear continuous warp contour for each residual*

section based on a subset of possible last sample lag values for each residual section

within a sub-range of possible last sample lag values for each residual section (column

2 lines 18-20) *and* <u>Gao</u> reads on the step of *modifying the residual by applying the*

calculated warp contour to the sections of the residual so that any dominant peak in

each section of the residual aligns with the dominant peak in the corresponding section

of the idealized signal (column 2 lines 20-22), *whereby dominant pitch peaks of the*

modified residual are regularly spaced (as would be expected from fixed period).

Because the references that warp residual to correspond to ideal signals or

targets do so by repeating (overlap), omitting or otherwise compensating (as occur with

Kroon *et al*, as would occur with the *estimates* omit in column 5 lines 6-12 and as the

shifting of column 3 lines 1-3 overlap) teach against the final limitation of the instant

application that *no portion of any section of the residual is omitted or repeated in the*

modified residual, this last feature was neither found to be anticipated nor was it found

in obvious combination in the prior art of reference.

-   Claims 2-9 and 13-24 depend on claims that were found to be allowable and so are

    they allowed as a consequence.

10.   As allowable subject matter has been indicated, applicant's reply must either

comply with all formal requirements or specifically traverse each requirement not

complied with. See 37 CFR 1.111(b) and MPEP § 707.07(a).

Conclusion

11.   The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure.

-   Gao (U.S. Patent 6,449,590 B1) speech coder using warping in long term pre-

    processing.

- Nakabayashi *et al* (Japan Patent 62-189833) logarithmic compression.

- Levine *et al* (U.S. Patent 5,886,276 A) multi-resolution scalable audio encoding.

- Prezas (U.S. Patent 4,561,102 A) pitch detector for speech analysis.

- Freeman *et al* (U.S. Patent 4,991,214 A) speech coding using sparse vector codebook & cyclic shift techniques.

- Moulsley *et al* (U.S. Patent 5,140,638 A) speech/method of encoding speech.

- Moulsley *et al* (U.S. Patent RE35057 E) speech coding using sparse vector codebook and cyclic shift techniques.

- Ko (U.S. Patent 5,648,989 A) linear prediction filter coefficient quantizer & filter set.

- Clarke (U.S. Patent 6,262,943 B1) signal processing for sensing a periodic signal in noise.

- Su (U.S. Patent 5,781,880 A) pitch lag estimation using frequency-domain low-pass filtering of the LPC residual.

- Kleijn *et al* (U.S. Patent 5,704,003) Relaxation Code-Excited Linear Predictive Coder for speech digitized using temporally defined frames - applies time shift to each sub-frame by applying matching criterion to current sub-frame, and determines sample-to-sample pitch delay.

- Ashley *et al* (U.S. Patent 6,113,653 A) for coding an information signal using delay contour adjustment.

12. Any inquiry concerning this communication or earlier communications from the

Examiner should be directed to Daniel A. Nolan at telephone (703) 305-1368 whose

normal business hours are Mon, Tue, Thu & Fri, from 7 AM to 5 PM.

If attempts to contact the examiner by telephone are unsuccessful, supervisor

Richemond Dorvil can be reached at (703)305-9645.

The fax phone number for Technology Center 2600 is (703)872-9314. Label

informal and draft communications as "DRAFT" or "PROPOSED", & designate formal

communications as "EXPEDITED PROCEDURE". Formal response to this action may

be faxed according to the above instructions,

or mailed to:
                    P.O. Box 1450
                    Alexandria, VA 22313-1450

or hand-deliver to: Crystal Park 2,
                    2121 Crystal Drive, Arlington, VA,
                    Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or

proceeding should be directed to Technology Center 2600 Customer Service Office at

telephone number (703) 306-0377.

                                    Daniel A. Nolan
                                    Examiner
                                    Art Unit 2654
DAN/d
March 29, 2004

DANIEL NOLAN
PATENT EXAMINER